

REMARKS

This is a response to the *Office Action* of January 26, 2007. In the outstanding *Office Action*, the Examiner maintained the *Restriction Requirement* and withdrew claims 1-9, 12-14, and 16-20 from further consideration. The Examiner rejected claims 10, 11, and 15 under 35 U.S.C. § 112, second paragraph as being indefinite. The Examiner also rejected claims 10, 11, 15, and 21 under § 102(b) as being anticipated by United States Patent No. 5,081,166 to *Kiehlbauch et al.* All of the pending claims were also rejected as anticipated by European Patent No. 555,959.

In response to the § 112 rejection, Applicant has amended claims 10, 11, and 15 to clarify that the “monomer mixture” recited in the claims refers to the core monomer mixture. These amendments are believed to ameliorate the Examiner’s indefiniteness rejection.

New claims 22 and 23 also have been added by the above amendments. Claim 22 is supported in the application by original claim 10, and in the application at page 10, lines 16-21. New claim 23 is supported in the application at page 10, lines 22-30.

The pending claims are believed to be clearly allowable over the art of record for the reasons advanced herein.

The present invention is directed to a process for producing emulsion polymers having a core/shell structure. According to the invention, the monomers for the core constituent are polymerized while the shell component is concurrently neutralized with a pH adjusting agent. It has been discovered that such a process enables the synthesis of a polymer that is easily swellable in water without the need for alkali treatment. The core/shell emulsion polymers are particularly suitable in pressure-sensitive adhesive compositions because they exhibit excellent strength, cohesive force, and tackiness. New claim 21, representative of the claimed subject matter, is reproduced below for ready reference with underlined emphasis on the central issue in this response.

21. (Previously presented). A process for producing a synthetic resin emulsion suitable for use in a pressure sensitive adhesive, wherein said emulsion has polymer particles with a core/shell structure, said process comprising the steps of:

a) polymerizing an unsaturated carboxylic acid monomer and a hydrophilic comonomer in an aqueous medium to produce a shell copolymer for the shell structure of the emulsion particles, where the copolymer is in solution in the aqueous medium;

b) combining core monomers with the aqueous medium to form a reaction mixture, and emulsion polymerizing the reaction mixture while concurrently at least partially neutralizing the shell copolymer in the aqueous medium by addition of a pH adjusting agent, to provide a synthetic resin emulsion having a core/shell structure which exhibits swelling in water without any alkali treatment, wherein said core monomers comprise radically polymerizable main monomer and a radically polymerizable functional monomer in the aqueous medium, and wherein said core monomers are selected such that the core polymer has a Tg of less than -20°C.

Turning first to the § 102 rejection over '166 *Kiehlbauch et al.*, the Examiner stated that the *Kiehlbauch et al.* reference discloses all of the elements of the claimed subject matter, and specifically notes that *Kiehlbauch et al.* teaches that the shell component of the polymer may be neutralized by addition of a pH adjusting agent "prior to and/or during polymerization of the core." See, January 26, 2007 *Office Action* at page 4. In this respect, the Examiner misapprehends the teachings of *Kiehlbauch et al.* The portion of the *Kiehlbauch et al.* reference cited by the Examiner (Col. 10) to meet this element of the claims relates to a conventional process involving neutralizing the shell component before adding monomer for making the core structure. This passage is reproduced below for ready reference:

In order to promote desired core-shell inversion, it
 5 may be desirable to adjust the pH of the first-stage polymer reaction mixture to swell and plasticize the first-stage polymer, thereby to promote second-stage polymer domain formation in the first-stage polymer. A plasticizer or a coalescing agent may similarly promote
 10 domain formation.

See, *Kiehlbauch et al.* at col. 10, lines 4-10.

The above passage discloses use of a pH adjusting agent prior to the polymerization of the core, to plasticize the first-stage polymer so as to promote the second-stage polymer domain formulation in the first stage polymer. *See, also*, Example 5. The passage does not teach or disclose the claimed subject matter of the invention because it does not remotely suggest to adjust the pH of the shell component while concurrently polymerizing the core monomers, for example, as can be accomplished by adding both the core monomer mixture and the neutralizing agent dropwise at the same time to the reaction mixture. On the contrary, as stated in the pending application, page 10, lines 22-25, the pH adjuster is added to an aqueous solution of the shell copolymer without its prior neutralization. In this regard, note Claim 10 and new Claim 22. In fact, the *Kiehlbauch et al.* patent relates to conventional methods of producing alkali swellable core-shell polymers. As stated in *Kiehlbauch* at col. 10, line 60-66:

Once the inverted core-shell latex has been formed, the pH of the emulsion is adjusted to dissolve the first-stage polymer. If acidic functional group monomers are selected for the first-stage polymer, addition of a suitable base is appropriate. If basic functional group monomers are selected for the first-stage polymer, addition of an acid is appropriate.

The above passage discloses adjusting the pH of the emulsion *after* polymerization has been completed. It is clear from both above passages that *Kiehlbauch et al.* contemplates two times for adjusting pH, a first one *prior* to polymerization of the core and a second one *after* the polymerization of the core/shell polymer is completed.

Kiehlbauch et al. does not suggest to neutralize the shell polymer *while* polymerizing the core polymer portion at the same time, as is embodied in the pending claims.

The techniques disclosed in *Kiehlbauch et al.* reflect conventional polymerization methods, which are specifically distinguished in the pending application. As stated in the in the specification, the invention enables the production of polymers that are easily

water-swellaable (without alkali) that are produced by adding neutralizing agent while concurrently polymerizing the core constituent. As stated in the pending application at page 15, lines 10-25.

[0067] The present invention is characterized in that, in the production of the synthetic resin emulsion, when the monomer for core copolymer formation is added dropwise, the monomer, together with a pH adjustor, is added.

[0068] When the pH adjustor is added together with the monomer for core formation, since the pH adjustor is added during polymerization for core polymer formation, partial neutralization can be homogeneously carried out from within the particles. As a result, for the coating after the film formation, the sensitivity to water is higher than that of an unneutralized coating or a post-neutralized coating. As compared with the case where polymerization is carried out after the neutralization of the aqueous copolymer (water-soluble polymer) solution for shell formation, the hydrophilic component is properly incorporated in the polymer without sacrificing the copolymerizability of the shell polymer and the core polymer. Therefore, the swellability of the coating with water, i.e., the sensitivity of the coating to water, can be further improved. pH adjustors usable in the present invention include, for example, alkali metal salts, ammonia, and amine.

Thus, the subject matter embodied in the pending claims is readily distinguishable from prior art techniques which employ a) neutralization after shell formation but prior to core polymerization; and b) post-neutralization after all components have been polymerized. The inventive polymerization technique, in contrast to the prior art, is believed to allow the water soluble shell polymer to be partially copolymerized with the core component, which results in improved water-swellaability of films made from the latex. In this respect, unlike conventional swellaable core-shell resins, the presence of alkali is not required with the inventive polymers in order to achieve good swellability in water—a feature which is also explicitly recited in new Claim 21 and not taught or suggested by the art of record.

Additional claims are believed independently patentable. Claims 10 and new Claim 22 recite that the core component is added to the shell component for polymerization where the shell component is in an unneutralized state and then concurrently polymerizing the core and neutralizing the shell. This feature is clearly distinguishable over the *Kielbauch et al.* reference which teaches either (i) to neutralize the shell component prior to addition of the core monomers; and (2) to polymerize the whole polymer (shell and core) prior to addition of any neutralizing agent. These claims should accordingly be allowed.

New claim 23 is likewise not suggested by the art of record. Claim 23 recites that the polymerization of the core component occurs while the reaction medium is held at a pH of less than 7. Thus, while the core is being polymerized and the shell is simultaneously being neutralized, the polymerization medium is generally in the acidic region. As stated in the pending application at p.10, this allows the polymerization of the core to proceed more stably than situations where it must proceed in the basic pH region. Here also, this feature is not suggested by *Kiehlbauch et al.*

The § 102 rejection over the '959 *Brodnyan et al.* reference is likewise untenable. Regarding the element of the pending claims which states that the core component is concurrently polymerized with the shell component is neutralized, the Examiner stated that *Brodnyan et al.* teaches:

combining monomers for the alkali insoluble core, including functional monomers, with the aqueous medium, and emulsion polymerizing the reaction mixture, wherein the first stage acid containing alkali soluble shell copolymer (referred to in the reference as the "second stage polymer, even though it is produced first in the alternative inverse polymerization process) may be neutralized by a base (page 5, lines 22-30),

See, January 26, 2007 Office Action at pp. 4-5.

The portion of *Brodnyan et al.* referred to by the Examiner is reproduced below:

The acid-containing second stage polymers of this invention may be neutralized with any kind of base. Bases that are particularly useful in neutralization of the second stage polymer are selected from the group consisting of ammonia, triethylamine, monoethanolamine, dimethylaminoethanol, sodium hydroxide and calcium hydroxide and all other Group IA and IIA hydroxides and the like. Based on equivalents of acid in the soluble polymer, 0.8 to about 1.5 equivalents of base are added to the second polymer, and more preferably about 0.9 to about 1.1 equivalents of base are added to neutralize and partially dissolve the soluble polymer so as to form a neutralized but insoluble polymer and an aqueous solution of neutralized soluble polymer. It is also possible to use multi-stage polymers of this invention without neutralization when the cementitious material is highly alkaline.

While the above passage states that the second-stage portion may be neutralized (the second-stage portion in this case appears to refer to the shell component), it does not state when or how it may be neutralized, and certainly it does not suggest to neutralize it while concurrently polymerizing the core constituent of the emulsion resin.

Additional claims are believed clearly distinguishable over the *Brodnyan et al.* reference. Claim 15 recites a method of making a pressure-sensitive adhesive composition which incorporates the core-shell emulsion resin. The *Brodnyan et al.* reference relates to the use of certain polymers as rheology modifiers for cementitious compositions, and does not appear to contemplate their use for pressure-sensitive adhesives.

All claims should be allowed for the reasons discussed above.

This response is being filed with a *Petition* and fee for a one-month *Extension of Time*. However, if any additional extensions or fees are required, please consider this paper a *Petition* thereof and charge our Deposit Account No. 50-0935. Likewise, if any fees for additional Claims are due, please charge our Deposit Account No. 50-0935.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Michael W. Ferrell", written in a cursive style.

Michael W. Ferrell
Reg. No. 31,158

Ferrells, PLLC
4400 Fair Lakes Court, Suite 201
Fairfax, VA 22033-3899
Telephone: (703) 968-8600
Facsimile: (703) 968-5500
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